

## **Actions to Reduce Public Health Impacts of Climate Change**

**Problem:** The World Health Organization's Intergovernmental Panel on Climate Change concluded in their fourth report on the issue that warming of the earth over the past century is "unequivocal" and that warming can be attributed to humans with a greater than 90% level of certainty (IPCC, 2007).

"Warming will occur through the next century even with significant reductions in new emissions, due to the prolonged residence time in the atmosphere of anthropogenic greenhouse gases (GHGs, e.g., carbon dioxide, methane, and ozone), and the slow response time of the ocean. (Hansen, 2005 and Dessai, 2003) Public health impacts associated with moderate degrees of global warming include increases in (1) heat-related morbidity and mortality, (Ebi et al., 2006 and Meehl et al., 2004); (2) the health consequences of increases in the frequency of strong typhoons, hurricanes, and other extreme weather events, (Milly et al., 2002, Running, 2006 and Emanuel, 2005); (3) increases in the intensity and range of transmission of vector-borne and other infectious diseases, (Epstein, 2001, Gubler, et al., 2001, Rose et al. 2001, Fleury et al. 2006, Kovats et al. 2004, Bradshaw et al. 2001, Epstein et al. 1998, Loevinsohn, 1994, and Hjelle et al. 2000); (4) respiratory and cardiovascular illness associated with increases in ozone air pollution related to higher ambient temperatures (Knowlton et al. 2004, and Hogrefe et al. 2004); and (5) malnutrition from threatened agriculture and fisheries, especially in developing countries. (Gregory et al. 2005, and Parry et al. 2005)" (APHA, 2007).

"Biological responses to climate change also have negative implications for human health, due to loss of ecosystem services (such as water purification), loss of species for medical research (such as marine and rainforest species for cancer therapies), altered infectious disease dynamics due to changes in temperature and precipitation patterns and ecosystem disruption, and disruption of food supplies due to desertification, changes in distribution of cultivatable land, and collapse of marine fisheries. (Schivian, 2002, Parmasan, et al. 2003, Root et al. 2003, Bradshaw et al. 2001, Epstein et al. 1998, and Loevinsohn, 1994). The adverse public health and environmental impacts of projected changes in global climate are likely to be especially severe among populations already living in extreme poverty throughout the developing world. The World Health Organization has concluded that most of the contemporaneous health-related impacts associated with global climate change are occurring in developing countries, with adverse impacts in 2000 estimated at approximately 5.5 million disability-adjusted life years (Campbell-Lendrum, 2003). The adverse public health impacts of projected changes in global climate also are anticipated to be especially severe among susceptible subpopulations, especially children, the elderly, those with underlying chronic diseases, and those in impoverished communities, particularly the urban poor, within the United States (Longstreth, 1999)." (APHA, 2007)

"Worldwide agriculture and land-use change are estimated to cause about one third of global warming due to greenhouse gas emissions (Paustian K, et al., 2006) whereas in the United States, agriculture contributes an estimated 8% of greenhouse gas emissions (Paustian K, et al., 2006). Agriculture's effect on climate change is caused both by emissions (such as burning fossil fuels) and reduced storage of gases in soils and other

media. Meat production is a particularly powerful contributor; the Food and Agriculture Organization of the United Nations (UN FAO) estimates that approximately 18% of all greenhouse gas emissions worldwide come from livestock production (Steinfeld H., et al., 2006). One study compared greenhouse gases from the average American diet and a same-calorie vegetarian diet and found that the difference, summed across the population, would account for 6% of all US greenhouse gas emissions (Eshel G. et al., 2006). Despite this impact on climate change risk, the contributions of the food system and meat consumption are generally left out of the discussion on global climate change." (APHA[2], 2007).

The State of Arizona is expected to experience adverse consequences from climate change. Researchers at the University of Arizona predict less winter snowfall, increased winter rainfall, and earlier snow melt resulting in reduced stream flow and more extensive/stronger forest fires (Garfin and Lenart, 2007, and Westerling et al. 2006). Higher temperatures would speed up evaporation, lower reservoirs, slow groundwater recharge, concentrate water pollutant levels, and increase salinity (Garfin, 2007 and Arizona Office of the Governor, 2006). In addition, higher temperatures increase water consumption. Researchers at Arizona State University have shown that a one degree Fahrenheit increase in daily low temperature results in an additional 290 gallons of water consumed per day in the Phoenix, Arizona area for a typical single family unit. (Guhatakurta, and Gober, 2007).

The State of Arizona is among many states, including coastal states that expect to experience costly and health threatening impacts from climate change (NACO, 2009).

Many states and cities are taking independent action to contribute their efforts towards reducing GHG emissions. States and cities need to ensure that their early actions are taken into account in the design of regional and federal programs. "The patchwork quilt that can result when states take individual approaches to the climate issue can be inefficient and pose challenges for business. Comprehensive federal legislation would provide consistency and certainty for businesses." (Rabe, B. 2006).

**Statement of Desired Action:** "The public health community must communicate the critical importance of primary prevention, namely the mitigation of climate change, in addition to preparing to provide secondary and tertiary prevention of climate change health effects." (APHA, 2007). AzPHA should support policies that reduce GHGs through reduced usage of energy, fossil fuel combustion, and personal motor vehicle use. "The public health community should advocate for mitigation and avoidance of climate change, track the impacts of climate change on human health, and assist with adaptation, to the degree possible, to those health effects caused by changes in climate that can not be prevented. The public health community also should assess and communicate the potential short-term public health benefits, as well as the potential adverse public health impacts, of GHG mitigation strategies." (APHA, 2007) AzPHA should support policies that create incentives for residential and industrial energy efficiency and increased use of alternative energy production, such as wind and solar power. Further, AzPHA should support policies that result in advanced technologies to reduce or capture carbon emissions from energy production; more efficient transportation; reduced consumption of fossil fuels; increases in

fuel economy; investment in research and development in low-carbon energy, transportation, agriculture, and manufacturing technologies including land-use policy, agricultural policy and international policy.

“Public health as a discipline will benefit from education, prevention and policy that can be put into place now to address adaptation and mitigation of climate change to reduce the likelihood of disaster, to reduce health consequences and to assure that people are working together to lessen the detrimental impacts on their communities and reducing their own personal impact on our environment.” (NACCHO, 2007)

**Relationship to AzPHA Priorities:** This resolution is consistent with AzPHA priorities. Strategic Direction 4 of the organization’s Strategic Plan is to increase impact on public health policy and one of the organization’s legislative priorities is to support and protect healthy environments including safe water, clean air and urban planning.

**Fiscal and Public Health Impact:** The costs of policies directed at reducing GHG emissions include research and development for inventing new technologies, initial higher cost of implementing new technologies, and increased electricity rates for residential and industrial consumers. Benefits of policies to reduce GHG emissions include reduced air pollution, increased motor vehicle fuel economy, less electricity usage, creation of revenues and profits associated with energy saving and alternative energy inventions and technologies, and reduced medical care costs associated with better public health. An example of these impacts is from the Clean Car Rule that was adopted by the Arizona Department of Environmental Quality (ADEQ) in 2008. In the Notice of Proposed Rulemaking (Arizona Secretary of State, 2008), ADEQ stated that the increased vehicle cost would be offset by lower vehicle operating costs and projected carbon dioxide emissions from light-duty vehicles in Arizona will be reduced from 34.1 million metric tons to 28.5 million metric tons by 2020, or a 16.4 percent reduction. In addition to lower carbon dioxide emissions, new vehicles subject to the Clean Car standards will emit less ozone-forming pollutants (1,436 tons of nitrogen oxides in 2018) and cancer-causing hazardous air pollutants. ADEQ cited a 2008 study (Jacobson, 2008) which estimated 1,000 additional deaths annually for each increase of one degree Celsius caused by carbon dioxide.

Costs and benefits for reducing GHG emissions will vary greatly from one technology to another. However, ozone is an air pollutant that has several direct connections to sources of GHG’s. In 2008, the U.S. EPA reduced the allowable ambient air standard for ozone over an 8-hour exposure period from 0.080 to 0.075 ug/m<sup>3</sup>. The EPA estimated the costs for the new standard would range from \$7.6 billion to \$8.8 billion in 2020. The estimated health-related benefits ranged from \$2.0 billion to \$17 billion in 2020 (U.S. EPA, 2008).

In addition to increased medical care costs associated with unmitigated climate change, there are expected escalating losses from weather related events. The costs come in the form of higher premiums, lowered coverage limits and increased restrictions in coverage. Individuals, businesses and governments may experience additional financial liability in response to private insurers restricting coverage and withdrawing from markets (Insurance Journal, 2005).

The Sierra Club asserts that renewable energy and energy efficiency policies could save a typical family \$350 per year in lower energy bills by 2020 (Sierra Club, 2009).

**Organizations Supporting and Opposing Suggested Actions:** Members of the Arizona State Legislature have opposed ADEQ actions related to climate change. For example, HB 2467, HCR 2023, and SB1147 introduced during the 2009 legislature, sought to prohibit ADEQ from taking actions to reduce GHG emissions (AzPHA, 2009). The Arizona Automobile Dealers Association opposed the ADEQ Clean Car rule during the public comment period for the rule. The U.S. Chamber of Commerce, automobile manufacturers, power industry companies and others have opposed federal efforts to develop policies to control GHG’s.

Groups supporting policies to reduce GHG emissions are equally numerous. The 2009 Arizona Legislature considered a senate resolution SCR 1013 promoting the development of renewable energy technology and applications in Arizona (AzPHA, 2009). Other organizations supporting policies that aim to control GHG’s include the World Health Association, American Public Health Association, National Association of City and County Health Officials, National Association of Counties, Sierra Club and numerous environmental advocacy organizations.

**Actions Needed:** AzPHA should adopt a resolution including specific actions that the organization and its members may take to reduce GHG emissions.

**References:**

American Public Health Association, 2007, Addressing the Urgent Threat of Global Climate Change to Public Health and the Environment, Policy No. 20078.

American Public Health Association [2], 2007, Toward a Healthy, Sustainable Food System, Policy No. 200712.

Arizona Office of the Governor, Climate Change Advisory Group [CCAG], 2006, “Climate Change Action Plan,” August 2006, 27.

Arizona Public Health Association, 2009, AZPHA Bill Tracking June 9, 2009

Arizona Secretary of State, 2008, Notice of Proposed Rulemaking, Article 18, Clean Car Standards, February 1, 2008, Vol 14, Issue 5

Bradshaw WE, Holzapfel CM. 2001, Genetic shift in photoperiodic response correlated to global warming. Proc Natl Acad Sci U S A.; 98(25):14509-14511.

Campbell-Lendrum D, Pruss-Ustun A, Corvalan C., 2003, How much disease could climate change cause? In: McMichael AJ, Campbell-Lendrum D, Corvalan C, Ebi KL, Githeko AK, Scheraga JS, eds. Climate Change and Health: Risks and Responses. Geneva, Switzerland: World Health Organization; 2003:133–155.

Chivian E, ed. Biodiversity: Its Importance to Human Health. Cambridge, MA: Harvard Medical School; 2002. Available at:

[http://chge.med.harvard.edu/publications/documents/Biodiversity\\_v2\\_screen.pdf](http://chge.med.harvard.edu/publications/documents/Biodiversity_v2_screen.pdf).  
Accessed March 7, 2007.

Dessai S., 2003, Heat stress and mortality in Lisbon Part II. An assessment of the potential impacts of climate change. *Int J Biometeorol.* 2003;48:37-44.

Ebi KL, Mills DM, Smith JB, Grambsch A., 2006, Climate change and human health impacts in the United States: an update on the results of the U.S. national assessment. *Environ Health Perspect.* 114:1318-1324.

Emanuel K. 2005, Increasing destructiveness of tropical cyclones over the past 30 years. *Nature.* 2005; 436:686-688.

Epstein PR., 2001, Climate change and emerging infectious diseases. *Microbes Infect.* 3:747-754.

Epstein P, Diaz H, Elias S, et al. 1998, Biological and physical signs of climate change: focus on mosquito borne diseases. *Bulletin of the American Meteorological Society.*79:409-417

Eshel G, Martin P., 2006, Diet, energy and global warming. *Earth Interactions,* 10(9):1-17.

Fleury M, Charron DF, Holt JD, Allen OB, Maarouf AR.,2006, A time series analysis of the relationship of ambient temperature and common bacterial enteric infections in two Canadian provinces. *Int J Biometeorol,* 60:385-391.

Garfin, G. and M. Lenart, 2007, "Effects on Southwest Water Resources," *Southwest Hydrology,* January/February 2007, 16-17, 34

Garfin, G., 2007, "Southwest drought regimes might worsen with climate change," *Southwest Climate Outlook,* April 2007, 11

Gregory PJ, Ingram, JS, Brklacich M., 2005, Climate Change and Food Security. *Philos Trans R Soc Lond B Biol Sci.,* 360(1463):2139-2148.

Gubler DJ, Reiter P, Ebi KL, Yap W, Nasci R, Patz J, 2001, A Climate variability and change in the United States: potential impacts on vector-and rodent-borne diseases. *Environ Health Perspect,* 109(suppl 2): 223-233.

Guhatahakurta, S. and P. Gober, 2007, "The Impact of Phoenix Urban Heat Island on Residential Water Use," *Journal of the American Planning Association,* vol. 73, issue 3, 317-329, September 2007

Hansen J, Nazarenko L, Ruedy R, et al., 2005, Earth's energy imbalance: confirmation and implications. *Science,* 308(5727):1431-1435. Epub April 28, 2005

Hjelle B, GE Glass, 2000, Outbreak of hantavirus infection in the Four Corners region of the United States in the wake of the 1997-1998 El Nino-southern oscillation. *J Infect Dis.* 181:1569-1573

Hogrefe C, Lynn B, Civerolo K, et al., 2004, Simulating changes in regional air pollution due to changes in global and regional climate and emissions. *J Geophys Res.* 109:22301.

IPCC, 2007, *Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Core Writing Team, Pachauri, R.K and Reisinger, A. (eds.)]. IPCC, Geneva, Switzerland, 104 pp.

Insurance Journal, 2005, “New Report Warns of Rising Threat to Industry from Climate Change,” 9/08/05.

Jacobson, M., 2008, Carbon Dioxide Emissions Linked to Human Mortality, *Science Daily*, January 4, 2008

Knowlton K, Rosenthal J, Hogrefe C, et al., 2004, Assessing ozone-related health impacts under a changing climate. *Environ Health Perspect*, 112:1557–1563.

Kovats RS, Edwards SJ, Hajat S, Armstrong B, Ebi KL, Menne B, 2004, The effect of temperature on food poisoning: a time-series analysis of salmonellosis in ten European countries. *Epidemiol Infect.* 132, 443–453.

Loevinsohn ME., 1994, Climate warming and increased malaria incidence in Rwanda. *Lancet*, 343:714–718

Longstreth J., 1999, Public health consequences of global climate change in the United States- some regions may suffer disproportionately. *Environ Health Perspect.* 107(suppl 1):169–179.

Meehl GA, Tebaldi C., 2004, More intense, more frequent, and longer lasting heat waves in the 21st century. *Science*, 305:994–997.

Milly, PCD, Wetherald RT, Dunne KA, Delworth T L., 2005, Increasing risk of great floods in a Parry M, Rosenzweig C, Livermore M. *Climate change, global food supply and risk of hunger.* *Philos Trans R Soc Lond B Biol Sci.*, 360(1463):2125–2138.

National Association of City and County Health Officials, 2007, *Statement of Policy: Local Public Health Role in Addressing Climate Change*, Policy No. 07-09

National Association of Counties, 2009, *Environment, Energy, and Land Use Resolution on Federal Assistance Related to Climate Change*, Adopted July 28, 2009

Parmesan C, Yohe G., 2003, A globally coherent fingerprint of climate change impacts across natural systems. *Nature*, 421:37–42.changing climate

Paustian K, Antle JM, Sheehan J, Paul EA., 2006, *Agriculture’s Role in Greenhouse Gas Mitigation.* Philadelphia: Pew Center on Global Climate Change

Rabe, B. 2006, Race to the Top: The Expanding Role of U.S. State Renewable Portfolio Standards. Pew Center on Global Climate Change, Arlington, VA.

Root TL, Price JT, Hall KR, Schneider SH, Rosenzweig C, Pounds JA., 2003, Fingerprints of global warming on wild animals and plants. *Nature*, 421:57-60

Rose JB, Epstein PR, Lipp EK, Sherman BH, Bernard SM, Patz JA., 2001, Climate variability and change in the United States: potential impacts on water and food borne diseases caused by microbiologic agents. *Environ Health Perspect.*, 109(suppl 2):211-221.

Running S.W., 2006, Is global warming causing more, larger wildfires? *Science*, 313:927-928.

Sierra Club, Clean Power Comes on Strong, downloaded August 29, 2009 from:  
<http://www.sierraclub.org/energy/cleanenergy/renewablesfactsheet.pdf>

Steinfeld H, Gerber P, Wassenaar T, Castel V, Rosales M, de Haan C., 2006, Livestock's Long Shadow. Rome, Italy: Food and Agriculture Organization of the United Nations. 2006. Available at: [www.virtualcentre.org/en/library/key\\_pub/longshad/A0701E00.htm](http://www.virtualcentre.org/en/library/key_pub/longshad/A0701E00.htm). Accessed March 13, 2007.

U. S. Environmental Protection Agency, 2008, Ozone Rule Slides, downloaded March 23, 2008 from: [http://www.epa.gov/groundlevelozone/pdfs/2008\\_03\\_text\\_slides.pdf](http://www.epa.gov/groundlevelozone/pdfs/2008_03_text_slides.pdf)

Westerling, A.L., H.G. Hidalgo, D.R. Cayan, T.W. Swetnam, 2006, "Warming and Earlier Spring Increase Western U.S. Forest Wildfire Activity" *Science*, volume 313, August 2006, 940-943

## **RESOLUTION: Actions to Reduce Climate Change**

**September 11, 2009**

**Whereas**, Scientific certainty regarding the role of human activities in changing the world's climate has been established; and

**Whereas**, warming will occur through the next century even with significant reductions in new emissions, due to the prolonged residence time in the atmosphere of anthropogenic greenhouse gases (GHGs, e.g., carbon dioxide, methane, and ozone), and the slow response time of the ocean; and

**Whereas**, public health impacts associated with moderate degrees of global warming include increases in (1) heat-related morbidity and mortality; (2) the health consequences of increases in the frequency of strong typhoons, hurricanes, and other extreme weather events; (3) increases in the intensity and range of transmission of vector-borne and other infectious diseases; (4) respiratory and cardiovascular illness associated with increases in ozone air pollution related to higher ambient temperatures; and (5) malnutrition from threatened agriculture and fisheries, especially in developing countries; and

**Whereas**, biological responses to climate change also have negative implications for human health, due to loss of ecosystem services (such as water purification), loss of species for medical research (such as marine and rainforest species for cancer therapies), altered infectious disease dynamics due to changes in temperature and precipitation patterns and ecosystem disruption, and disruption of food supplies due to desertification, changes in distribution of cultivatable land, and collapse of marine fisheries;

**Whereas**, the adverse public health and environmental impacts of projected changes in global climate are likely to be especially severe among populations already living in extreme poverty throughout the developing world, and, as the World Health Organization has concluded, most of the contemporaneous health-related impacts associated with global climate change are occurring in developing countries, with adverse impacts in 2000 estimated at approximately 5.5 million disability-adjusted life years; and

**Whereas**, the adverse public health impacts of projected changes in global climate also are anticipated to be especially severe among susceptible subpopulations, especially children, the elderly, those with underlying chronic diseases, and those in impoverished communities, particularly the urban poor, within the United States; and

**Whereas**, the public health workforce must include practitioners who are able to communicate the impacts of projected changes in global climate to their communities and constituents;

**Whereas**, the State of Arizona is expected to experience adverse consequences from climate change including reduced stream flow, more extensive/stronger forest fires, more



evaporation, lower reservoirs, slow groundwater recharge, concentration of water pollutant levels, increased salinity and increased water consumption.

**Therefore Be It Resolved** that the Arizona Public Health Association supports cost effective policies that reduce GHGs through reduced usage of energy, fossil fuel combustion, and personal motor vehicle use.

**Further Be It Resolved** that the Arizona Public Health Association supports the ongoing collection and analysis of data related to the potential public health benefits, as well as the potential adverse public health impacts, of GHG mitigation strategies.

**Further Be It Resolved** that the Arizona Public Health Association supports cost effective policies that create incentives for residential and industrial energy efficiency and increased use of alternative energy production, such as wind and solar power.

**Further Be It Resolved** that the Arizona Public Health Association supports cost effective policies that result in advanced technologies for more efficient transportation and reduction or capture of carbon emissions from energy production.

**Further Be It Resolved** that the Arizona Public Health Association supports cost effective land-use policies that reduce GHG emissions.

**Further Be It Resolved** that the Arizona Public Health Association supports cost effective agricultural policies that reduce GHG emissions.

**Further Be It Resolved** that the Arizona Public Health Association supports education about the food supply system’s contribution to greenhouse gases and the benefits of eating more locally produced food and reducing industrial meat consumption.

**Further Be It Resolved** that the Arizona Public Health Association supports developing capable public health leadership and personnel to assure the capacity of public health departments, agencies and programs to respond to the health effects of climate change.

**Further Be It Resolved** that the Arizona Public Health Association supports federal assistance to states and communities to provide financial and technical assistance to governments to help develop and implement local climate change adaption and mitigation plans and projects, including smart growth initiatives, mass transit development, renewable energy deployment, acquisition of high efficiency fleet vehicles and protection of water supplies.

**Further Be It Resolved** that the Arizona Public Health Association supports cost effective international policies that reduce GHG emissions.

Submitted by Al Brown  
September, 2009